

# Study Guide

For use with pages 385–390

**GOAL**

Use graphs to represent relations and functions.

## VOCABULARY

A **relation** is a pairing of numbers in one set, called the **domain**, with numbers in another set, called the **range**. Each number in the domain is an **input**. Each number in the range is an **output**.

**EXAMPLE 1**

### Identifying the Domain and Range

The table below shows the scores, with respect to par, of a player's first 7 golf matches of the season. Identify the domain and range of the relation.

Match number, $x$	1	2	3	4	5	6	7
Score (with respect to par), $y$	10	7	5	-3	0	-3	-5

### Solution

You can represent the relationship between the match and the score using the ordered pairs  $(x, y)$ :  $(1, 10)$ ,  $(2, 7)$ ,  $(3, 5)$ ,  $(4, -3)$ ,  $(5, 0)$ ,  $(6, -3)$ ,  $(7, -5)$ . The domain of the relation is the set of all inputs, or  $x$ -coordinates. The range is the set of all outputs, or  $y$ -coordinates.

**Domain:** 1, 2, 3, 4, 5, 6, 7

**Range:** -5, -3, 0, 5, 7, 10

**EXAMPLE 2**

### Representing a Relation

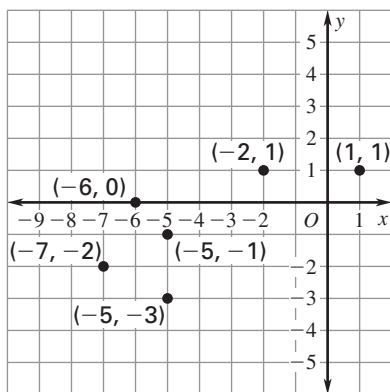
Represent the relation  $(-7, -2)$ ,  $(-6, 0)$ ,  $(-5, -1)$ ,  $(-5, -3)$ ,  $(-2, 1)$ ,  $(1, 1)$  as indicated.

a. A graph

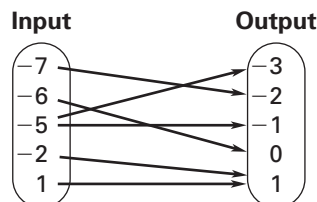
b. A mapping diagram

### Solution

a. Graph the ordered pairs as points in a coordinate plane.



b. List the inputs and the outputs in numerical order. Draw arrows from the inputs to their outputs.



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**Exercises for Examples 1 and 2**

Identify the domain and range of the relation. Then represent the relation as a graph and as a mapping diagram.

1.  $(-1, 0), (0, 8), (2, -3), (3, 4), (3, 7)$       2.  $(-4, -6), (-1, -2), (5, -8), (5, -2)$

**VOCABULARY**

A relation is a **function** if for each input there is *exactly one* output. When a relation is represented by a graph, you can use the *vertical line test* to tell whether the relation is a function. The **vertical line test** says that if you can find a vertical line passing through more than one point of the graph, then the relation *is not* a function. Otherwise, the relation *is* a function.

**EXAMPLE 3 Identifying Functions**

Tell whether the relation is a function.

- a. The relation in Example 1, consisting of the ordered pairs (match, score) for 7 matches:

$(1, 10), (2, 7), (3, 5), (4, -3), (5, 0), (6, -3), (7, -5)$

- b. The relation in Example 2, consisting of the following ordered pairs:

$(-7, -2), (-6, 0), (-5, -1), (-5, -3), (-2, 1), (1, 1)$

**Solution**

- a. The relation *is* a function because every input is paired with exactly one output. This makes sense, because you can only have one score per match.
- b. The relation *is not* a function because the input  $-5$  is paired with two outputs,  $-1$  and  $-3$ .

**Exercises for Example 3**

Tell whether the relation is a function. Explain your reasoning.

3.  $(-10, 5), (2, 2), (-1, 0), (0, -1), (-10, 4)$
4.  $(8, 3), (-1, 3), (2, 4), (6, 3)$